Great Lakes Watershed Ecological Sustainability Strategy

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Broad Questions Addressed by GLWESS Project

- **How much, and where?**
  - Determine relationships between BMP and environmental improvement (Dose-response curve)

  - Define success and set environmental goals

- **How to motivate at scale?**
  - Create new reward for performance transactions to achieve the goals

GLWESS Project Watersheds

- Paw Paw, Saginaw, Maumee

- Forecast the amount of BMPs needed to achieve different flow, water quality, and biological conditions

- Develop and test new approaches and transactions for achieving environmental goals

Ecological Endpoints for Valuing Transactions

- Impact of degraded stream habitat, altered hydrology, and water quality on fish and macroinvertebrate indicators

- Watershed export of sediment and nutrients:
    - Phosphorus (P), especially **soluble reactive P**
    - Nitrogen (N)
    - Suspended solids

- Eutrophication & sedimentation impacts in Western Lake Erie Basin (WLEB):
    - Harmful algal blooms (HABs)
    - Nuisance benthic algae in WLEB
    - High sedimentation rates in Federal navigation channel

Options for Society to Reach BMP Goals

- Voluntary (with outreach)

- Governmental Incentives (Farm Bill Programs)

- Regulation

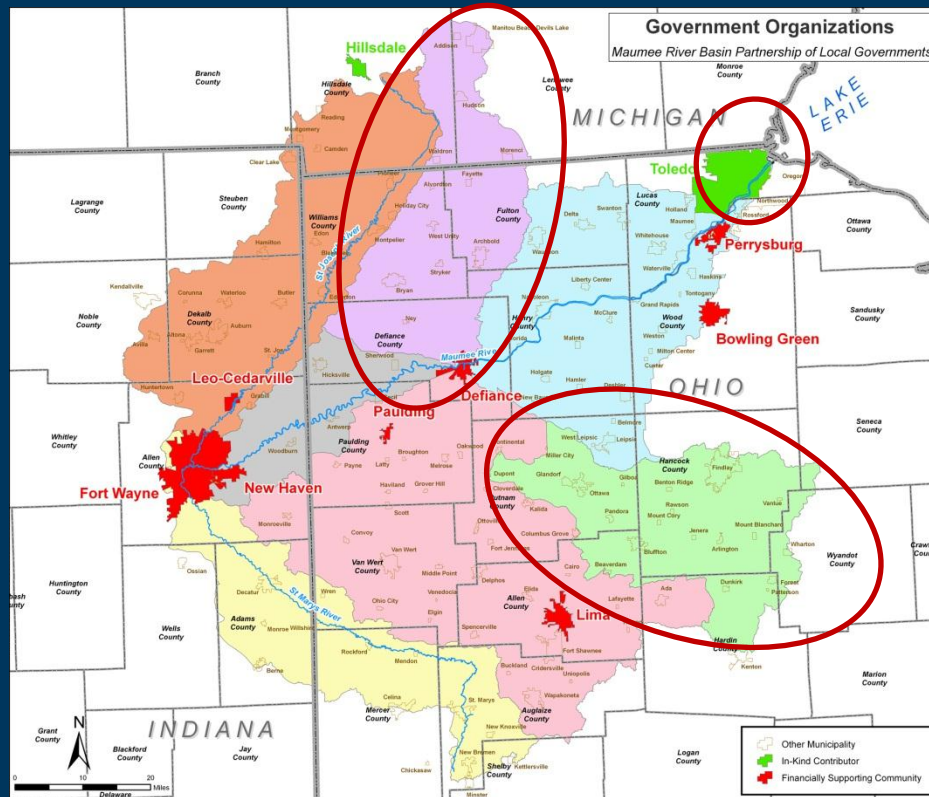- Market-based

- Combinations of above

- Agricultural Drainage Management

- Reverse Auctions

- Certification
  - Company or Product
  - Farmer
  - Agricultural Retail

Comparison of Project Focal Areas

GLWESS

WLEB CEAP

Comparison of Tasks and Objectives

GLWESS	WLEB CEAP
Develop communication plan & establish advisory panel	Develop communication plan & establish advisory panel
Develop science/models to support transactions • Watershed (not in WLEB) • Coastal (sediment & algae) • Develop SWAT model for Maumee • Link to WLEE model • Create user-friendly version of linked model • Develop downscaled SWAT models for Tiffin & Blanchard	Develop downscaled SWAT model for entire project area Develop ecological models that predict riverine biological endpoints from SWAT and other variables
Evaluate transactional frameworks • Ag drain management • Farmer certification • Ag retailer certification	Develop conservation scenarios for select subwatersheds and predict changes in water quality, quantity and biological endpoints

GLWESS/LimnoTech Contributions

- Enhanced credibility, unique expertise on sediment and nutrient fate and transport in rivers

- Review and advice on model parameterization and calibration

  - On basis of direct knowledge of activities and fine scale databases in the Tiffin and Blanchard watershed

- Code and documentation for the ephemeral gully transport sub-model (SWAT 2009 for Tiffin)

- Fine scale models of the Tiffin & Blanchard watersheds

- WinModel visualization and analysis SWAT user interface

  - If desired, for use in developing and applying the Maumee watershed model.

WLEB CEAP, PostDoc, ARS Contributions

- ARS team developed the SWAT model and bring knowledge and prestige to both projects
- CEAP Cropland Team and PostDoc would have primary responsibility for developing the downscaled (NHD+) SWAT model for the entire WLEB watershed.
  - Work closely with LimnoTech to calibrate model
- Support should significantly improve the accuracy of the downscaled SWAT model by:
  - Incorporating tile drainage into model set up
  - Conducting spatially distributed calibration with SPARROW and field data
  - Incorporating historic land cover to provide an additional baseline
  - Incorporating potential future climate scenarios